PUBLIC WORKS.

CITY COUNTY STATE

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From booklet, "Highways and Railways for the Defense of Our Nation," published by Sauerman Bros., Chicago, Ill.

The California Highway Commission makes the following statement in its Biennial Report:—

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The Lackawanna Steel Sheet Piling Cut-off Wall that prevents underscouring and seepage at the 145-foot Apishapa Dam in Colorado

DOUBLE-LOCK LACKAWANNA INTERLOCK

A three-line positive watertight joint contact with greatest tensional strength.

The Apishapa Consolidated Irrigation Co., of Fowler, Colo., found it necessary to construct this earthen dam across one of its irrigation streams at a location in a canyon where the banks were steep cliffs of sandstone and where the nature of the sub-soil demanded protection of the dam against seepage and underscouring. A permanent cut-off wall of Lackawanna Steel Sheet Piling underneath the dam and penetrating 28 to 32 feet of clay, sand and gravel to sandstone bedrock was therefore considered to be most desirable for this purpose.

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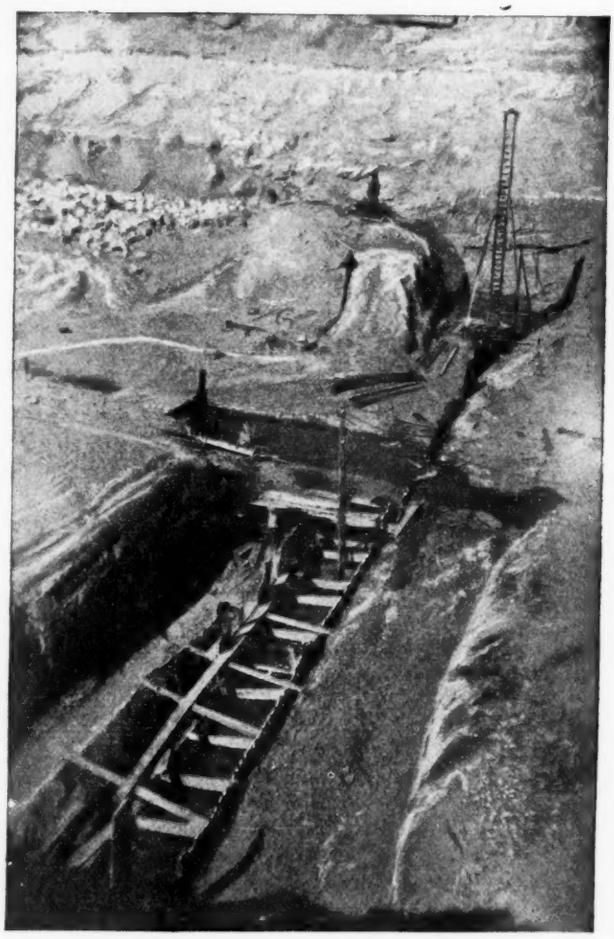

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PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL AND PUBLIC WORKS" and "CONTRACTING"

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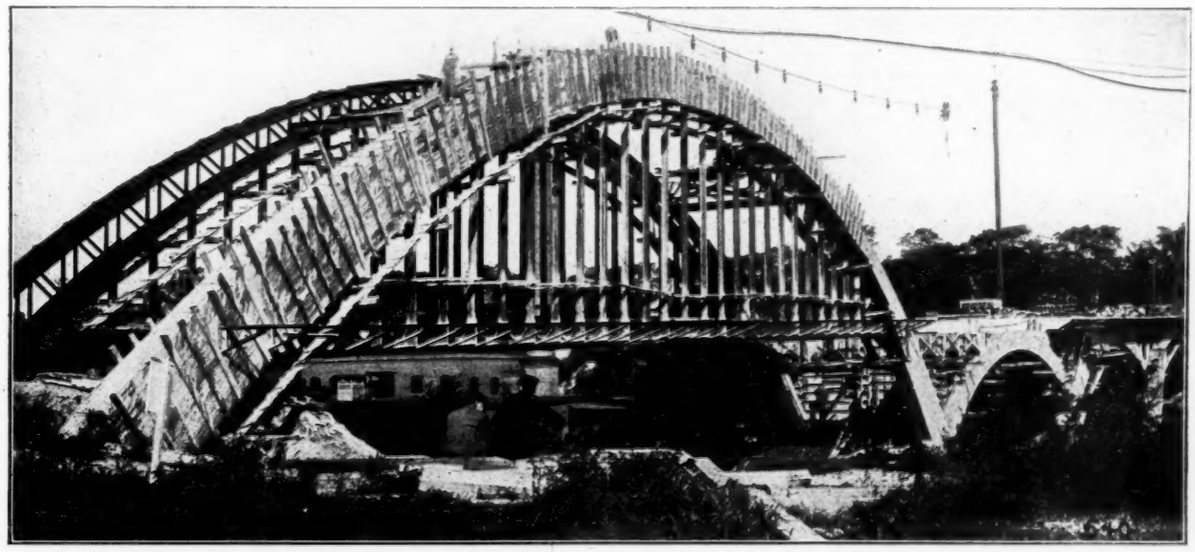
Self-Supporting Arch Rib Erection

Concrete bridge spans up to 200 feet long reinforced by structural steel members detailed and proportioned to carry the fresh concrete and resist all stresses during construction and subsequently to provide for tension and shear in the finished structure. Reinforcement trusses fabricated and erected in sections by derrick booms. Rib forms supported by reinforcement trusses and concreted by cableway.

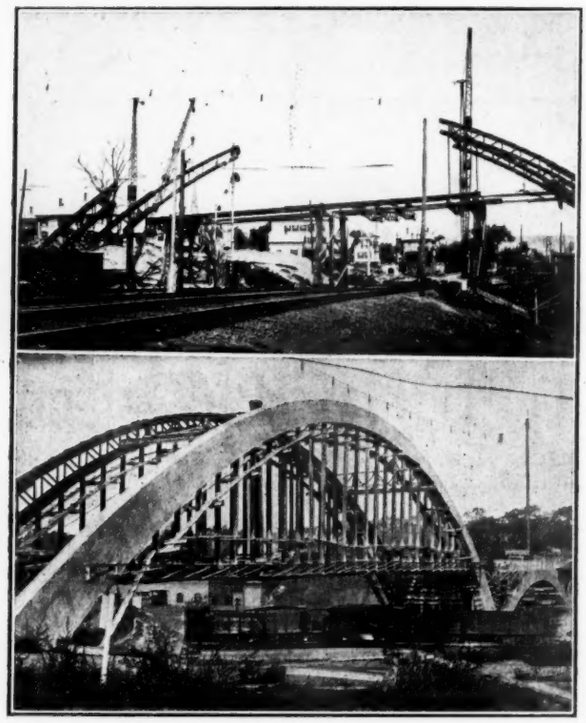
It has long been a desideratum to utilize for erection supports the potential strength of steel used for the permanent reinforcement of concrete arch ribs and girders. This has so seldom been accomplished that a very successful example is here described although the work was executed several years ago. The principles, however, have not been generally applied, and are at this time even more important because of the ever increasing cost of labor and materials, both of which were in this case diminished by the methods selected for an important piece of work of ordinary character, conditions, and requirements.

In Fitchburg, Mass., Fifth street is carried over the tracks of the Boston & Albany and of the New York, New Haven & Hartford railroads and across the Nashau river on a highway bridge 665 feet long with a 26-foot roadway and two 6-foot sidewalks supported on reinforced concrete arches, one of 32 feet, 7-inches span, one 76 feet, 3-inches, two 113-foot, one 115-foot, 9-inches, and one 200-foot, 4½-inch span.

Each span consists of two segmental monolithic ribs reinforced with structural steel trusses and connected, in the long span, by transverse steel struts enclosed in concrete. The ribs of all spans are in



STRUCTURAL STEEL REINFORCEMENT RIBS FOR 200-FOOT SPAN ERECTED. ONE OF THEM SUPPORTING CONCRETE FORMS FOR RIBS AND VERTICALS.



Erecting Rib Trusses with Derricks. One 220-Foot Truss Concreted and Stripped.

the same vertical planes and the roadway which is suspended from the ribs of the 200-foot span is carried on the spandrel walls of the other, deck, spans.

The bridge is on a tangent and a 4 per cent. grade, the latter making it difficult to secure a uniform and symmetrical appearance of the arches, which were accordingly designed with different spans, rise, and curvature, which secured a very pleasing and graceful effect. The arches were treated so as to develop a uniform thrust of all spans at each pier, thus insuring stability and balanced forces, reducing the sizes of the piers and affording greater freedom of construction operations.

The arch ribs were so proportioned, and their structural reinforcement was so designed, that the cross-sectional areas required to resist the stresses of the finished structure were adequate for all of the erection stresses, thus providing for construction without involving any extra cost for the steel work.

The steel arch ribs were therefore designed for temporary service as independent elements, as well as for their permanent service. They were built with rectangular cross-sections and parallel top and bottom flange angles connected by riveted latticing in vertical and horizontal planes.

Each rib for the 200-foot span was fabricated in several sections, shipped separately, and erected by a pair of steel guy derricks, commencing at the ends and assembling successive sections, which were temporarily supported until the derricks lifted the center sections. The sections were connected by field splices, making complete and independent arches spanning the railroad tracks without obstructing them.

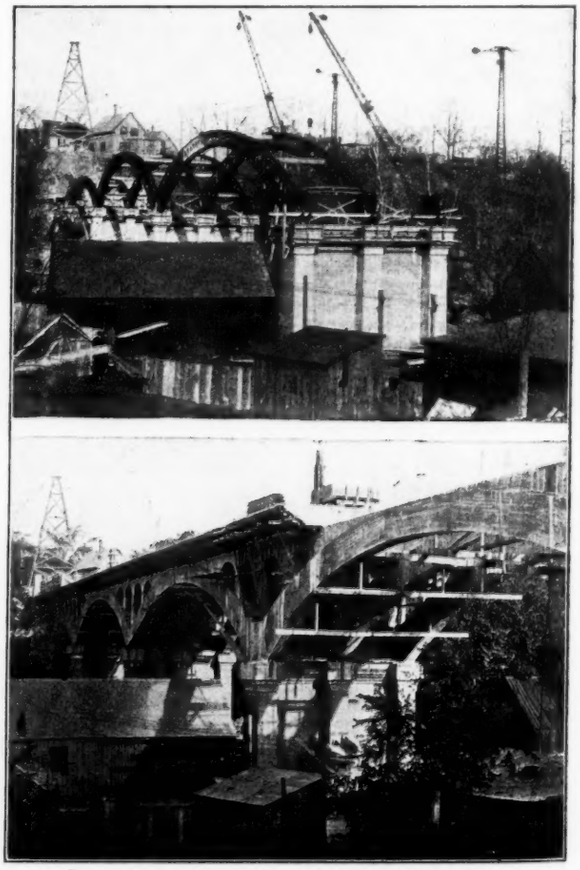
It was at first intended to attach vertical suspenders to these ribs before erection, then connect the floorbeams to them, working from above without occupying any portion of the right of way between the abutments. Later it was found practicable to erect falsework bents between the tracks, carrying on them overhead longitudinal I-beams clearing the train service and supporting the permanent roadway floorbeams, which were later suspended from the arch ribs without involving the preliminary erection of the vertical suspenders.

The ribs of the 32-foot 7-inch span were riveted up complete at the bridge shop and were erected as units by the derricks. The ribs for the remainder of the spans were shipped from the bridge shops in sections, assembled and riveted together in horizontal planes at the site and lifted bodily to position by pairs of derricks.

After the ribs of each span had been properly braced together, the forms for the concrete were built around them and supported by them. For the short spans, they were concreted by small movable mixers advancing at roadway level as the work progressed and providing all of the concrete for ribs, spandrels and floor.

A cableway parallel to the bridge axis was supported at one end of the long span on a mast and at the opposite end on a transverse bent, and served to deliver the concrete for the main span.

The bridge cost about $60,000. It was designed, and the erection method was devised by J. H. Fuertes, consulting engineer, and was built by the McHarg-Barton Co., contractor.



Short Span Reinforcement Trusses Erected. Arch Ribs Concreted, Cableway Installed.

Drag-line Rock Excavation for Large Dams

Buckets of 4½-yard capacity, electrically operated from 100-foot steel booms, handle great quantities of limestone and shale rock in Miami Conservancy District flood control work more safely, conveniently and advantageously and with a smaller labor force than could be done with steam shovels in cuts 100 feet deep, extending 63 feet below the level of the machine, which deposited spoil 37 feet above its track. The machine moved transversely in very wide cuts and in others completed the excavation in a single longitudinal trip.

The construction of the five great dams for the controlling works and retarding reservoirs required for flood protection in the Miami Conservancy District involved the excavation and removal of about 400,000 cu. yds of rock, about 70 per cent of which has been satisfactorily handled by large electric drag-line machines of the Lidgerwood and Bucyrus types. The rock was mostly of the Cincinnatian formation, consisting chiefly of limestone and shale, occurring in approximately horizontal strata from 1 to 6 inches thick, the remainder running up to a thickness of 5 feet.

To a depth of 10 feet below the surface of the ground the rock is weathered and rotted, and could be removed without blasting. Below that elevation it required to be drilled and blasted.

The cuts were comparatively long and narrow, with extreme depth and width of 100 feet and 380 feet respectively, extending from 22 to 38 feet below low-water level through a maximum thickness of 77 feet of rock.

Advantages of Drag Lines.

Very nearly all of the excavation was handled by large electrically operated drag-line machines that were selected in preference to the more rapidly operating, powerful steam shovels for several reasons, the principal ones being that they could complete the excavation of the full size cross-section of the cut as they advanced, thus permitting concreting to rapidly follow the excavation and to be commenced long before the completion of the latter; that the machinery could be set at a level far above the bottoms of the cuts, thus eliminating or greatly diminishing the danger from floods; that they could deliver the spoil at a much higher elevation above the track on which the machine was operated; that they were much more flexible in the adaptation to the varying width and depth of the excavation, and that the machines were operated with much smaller labor forces than would be required for steam-shovel operations.

At Englewood and Germantown.

At the Englewood and Germantown dams, where a total amount of 97,712 yards of rock was excavated, the deep trenches were from 30 to 100 feet wide at the bottom. The loose rock was excavated first to a depth of 7 to 10 feet below the surface of the ground, and tripod drills were set up in the bottom of the excavation, drilling holes with average depths of 18 feet and 28 feet, which were charged with about one-half pound per yard of 40 per cent dynamite, which loosened and shattered the material sufficiently for it to be loaded by the drag-line buckets into 12-yard air dump cars drawn by 40-ton locomotives. The sides, bottoms and corners of the cuts were trimmed with jap drills, and the trimmings were removed at Germantown by the drag-line buckets, and at Englewood were loaded by hand into skips lifted out of the pit by a locomotive crane.

Two-Trip Method at Huffman.

At the Huffman dam, where 39,500 yards of rock was excavated, the drilling was mainly done by a well drill, which averaged 45 feet of holes per day at a direct cost of 27 cents per foot, and by a wagon drill, which made a maximum record of 240 feet in one day. About 0.52 pound of dynamite were required per yard of rock.

The rock was blasted in three successive benches, each about 20 feet thick, and was removed by a drag-line machine, with a 4½-yard bucket operated by a 100-foot boom. At the first trip along the center line of the cut the machine removed the spoil from the upper bench, and at the second trip on the same line removed all of the remainder of the excavation from both lower benches, filling and lifting the buckets from a maximum depth of 64 feet below the loading track and 68 feet below the level of the ground on which the machine stood.

At Lockington.

At the Lockington dam, where the rock excavation consisted of only about 4,560 yards of hard limestone from 4 to 18 inches thick of the Silurian formation, the concreting followed very closely on the excavation, making it inadvisable to use large charges of explosives. Holes were therefore made with jap air drills and loaded with

light charges, which broke the cut in sizes suitable for concrete plums and rip-rap at the rate of one yard of rock for each four pounds of 40 per cent dynamite. The rock was loaded by hand in 1¾-yard bottom-dump buckets handled by two 105-foot booms of guy derricks that delivered directly to the concrete forms or to 5-yard dump cars.

Transverse Method at Taylorsville.

At Taylorsville, where the maximum dimensions of the cut were 100 feet deep, 380 feet wide and 2,900 feet long, the 250,000 yards of rock excavation was overlaid by 523,000 yards of earth, most of which was removed by a hydraulic giant or monitor. For the rock cut, 77 feet deep, the drilling and blasting were done in two lifts, the upper one 26 feet high. Holes 4 inches in diameter were made 10 feet apart in rows 10 feet back of the space by three Cyclone drills operated by a 7½ horsepower electric motor at the rate of 50 linear feet per day. The holes were spaced 5 feet clear of the sides of the excavation and were not carried nearer than 2 feet from the bottom. From 75 to 100 pounds of 40 per cent dynamite or, later, of 72½ per cent gelatine dynamite, originally intended for the Italian War Department, were used for each hole.

Smaller holes were also drilled by three air machines, but neither the large nor the small holes were sprung because the strata penetrated were so thin and weak that they cratered and broken rock dropped from the enlarged upper part of the holes, filling the lower part and making it necessary to redrill the hole. The lower 2 feet of rock was drilled with jap drills and jack hammers, and blasted with 1-pound or 2-pound charges of dynamite. The holes, 3 feet apart, were from 4 to 6 feet deep, and the charges were exploded by electricity, sometimes in groups of as many as 235 at one time. About 0.72 pounds of 40 per cent dynamite and 0.5 pounds of the 72½ per cent dynamite were used per yard of rock.

The rock was broken into slabs from 3 to 5 feet thick, which required to be block-holed and blasted again to reduce them to a size that could be handled by the 3½-yard drag-line bucket operated from a 100-foot boom of the machine, moving transversely back and forth across the cut at an elevation of 63 feet above the bottom of the excavation, and handling material 37 feet above its base. The buckets delivered to 12-yard dump cars hauled, at the same grade as the machine, or 10 feet below it, by 40-ton locomotives.

Just above the rock there was a layer, 20 feet or more in thickness, of tough clay and hardpan, which was drilled by well drills, the holes sprung with dynamite and charged with 1 pound of black powder per yard of spoil.

This work was executed under the direction of the Miami Conservancy District, Arthur E. Morgan, chief engineer, and Charles H. Paul, assistant chief engineer, and described in the Miami Conservancy Bulletin.

Highway Prices and Highway Machinery

The survey of the highway situation in the Middle Atlantic States contained in the paper of Mr. Knopf, which is abstracted elsewhere in this issue, contains a number of points of interest, and suggestions to which highway officials may well give heed.

One of these is the statement that last year bids which were received late in the season, ranged ten per cent to fifteen per cent higher than those submitted earlier in the season. Even though there were no difference in the prices submitted, the advantages of letting contracts early so as to make it possible to complete the work during the season should of itself be sufficient incentive for the immediate letting of highway contracts contemplated for this year. When there is added, however, the further inducement of better prices obtained by early letting, there would seem to be no good reason for deferring such lettings and every reason for hastening them where possible; and with a forceful man at the head of affairs mighty few things are impossible.

Another feature which stands out prominently in this report is the scarcity of labor, which threatens to be even greater this year than it was last. Mr. Knopf believes that, to meet this exigency, contractors will make greater use of labor-saving machinery and devices. There seems to be little question that the highway contractors, who are to handle economically and profitably any considerable part of the work which it is possible for them to obtain this year, will resort to mechanical substitutes for the labor which it is impossible to secure, and so much of which, when secured, is found to be inefficient.

In many cases the use of such devices will be found to directly reduce the cost of construction, in view of the present high wages demanded; but even where there is no direct saving, the possibility of increasing the output and completing a contract which otherwise might have to hold over to another season will in the long run prove profitable by eliminating the no inconsiderable expense involved in such carrying over of contracts, which requires the storing and protection of machinery and materials, with more or less loss of the latter, and other expenses with which contractors are well, and some of them disastrously, familiar.

City Managers

Ten cities having an aggregate population of approximately 100,000, have come under the commission-manager system of municipal government in the last three months. The largest of these are Muskegon, Mich., with 25,500 population; Lynchburg, Va., with 21,830, and Newport News, Va., with 20,000. The smaller communities adopting this form include West Palm Beach, Sanford and Tallahassee, in Florida; Pittsburg, Cal., Painsville, O., and Sallisaw and Walters, Okla.

There are, in the United States more than 160 cities having city managers. Of these more than fifty are cities of more than 10,000 population. Three of them, Grand Rapids, Mich., and Dayton and Akron, O., having more than 100,000 each.

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A. PRESCOTT FOLWELL, *Editor*
FRANK W. SKINNER, *Associate Editor*

200 Per Cent Profit Without Risk

In a recent discussion of post-war reconstruction, Alfred E. Marling, president of the Chamber of Commerce of the State of New York, called attention to the estimates that a 10 per cent increase in production would cut 20 per cent from living costs and that another 10 per cent reduction in buying unnecessaries would insure an additional 20 per cent decrease in prices, thus effecting a total decrease of 40 per cent in the high cost of living.

The plea to make these simple and easy percentages is the fundamental element of renewed prosperity and safety not only in this country, but throughout most of the civilized world. It strikes at the root of the pernicious, still increasing and wholly unnecessary high cost of living and shows plainly the way to destroy practical profiteering whether by producers, dealers or by labor. It is the blessed gospel of thrift and efficiency which every honest citizen should preach and practice.

Erecting Concrete Arches without Falsework

The description in this issue of the erection of long concrete arch bridge spans without the use of temporary falsework is of special interest and importance in that it indicates a method which is available in some instances for a material reduction of construction costs on important work. The method is based on the very sound principle of utilizing during construction operations the potential strength of portions of the final structure while the latter is in an incomplete state.

In many reinforced concrete structures the reinforcement steel could, if properly utilized, support the structure during erection or construction; but as it is generally detailed solely for service in the finished structure after it is embedded in a solid mass of concrete it cannot be easily made available for preliminary service. In this case the designing engineer dimensioned the structure and detailed the steel ribs so that the latter were independently efficient and were sufficient both for permanent and temporary stresses. In many cases where the original designs do not make this provision it would be possible for the contractor to secure such modifications effecting this result as would enable him to materially reduce the cost and increase rapidity of construction.

The Obsolescence of Two-Course Concrete Pavements

The reports of concrete pavements laid in a large number of cities in 1916 show that 24 per cent were laid with two courses; in 1917 28 per cent were laid in two courses, while in 1919, the percentage has diminished to 11 per cent, indicating that the construction of concrete pavements in two separate operations is rapidly becoming a thing of the past.

The principal advantage claimed for the two-course concrete pavements was the opportunity to effect an economy by using a cheaper concrete with less cement in the lower course than in the upper course. The disadvantages are the necessarily impaired strength for the same thickness of pavement; longer time spent in construction; greater opportunities for poor work, mistakes and defects; the danger of separation between the upper and lower courses; and of the cracking and disintegration of the latter.

At the present price of cement, and considering the leanest mixture likely to be used for a 6-inch base course, and the richest one for the 2-inch wearing course, the saving in cost of cement can hardly exceed about 50c per square yard which is offset by the increased labor cost. Assuming the cost of labor for concreting alone in a one-course pavement to be a very conservative minimum of $1.25 per square yard for one-course pavement, it will be very nearly doubled for a two-course pavement of the same thickness where all of the operations are repeated, and at nearly the same speed, except that of finishing which is only a few cents a square yard. Besides this, the surface of the base course may require protection or repairs and if the top is covered with dust, leaves, rubbish, or any other foreign material, it must be removed and the concrete thoroughly cleaned before the second course can be laid. The placing of the second course is also somewhat critical because if it is too long delayed, bonding with the first course will be imperfect, and if it is laid too soon, there is difficulty in working over the first course.

It therefore appears that there is little or nothing to be gained and considerable to be lost in making a concrete pavement with two courses. A massive monolithic pavement with uniform strong concrete throughout possesses greater bearing, bending, and distributing strength than a laminated pavement of the same dimensions; is likely to be cheaper, more durable and satisfactory than the former, so that we may look with satisfaction at the general disappearance of two-course concrete pavements except in cases where a concrete wearing surface can be advantageously placed on existing concrete base or under occasional special conditions.

Public Works' Strikes

The right to strike, that is to quit work, is in most cases undeniable for individuals and in many cases, right for groups and trades. Under proper conditions and rightly conducted, such strikes may be beneficial and desirable. They must not however, spell conspiracy, nor be attended with violence and intimidation, nor effect a breach of trust, nor seriously jeopardize the comforts and welfare of the

general public or the safety of innocent victims. Too often these points have been disregarded or even wantonly violated and in a large number of cases strikes have proved to be brutal and dishonest weapons in the hands of piratical trusts and as such, a great menace to safety and prosperity and a principal factor in the present reduced production and high cost of living.

Labor is entitled to a living wage proportioned to its efficiency and reliability, to good working conditions, and to collective bargaining. It is not entitled to enforce extortionate demands, reduce efficiency and output, nor to either actively or passively endanger the public safety or property.

Labor engaged on the production, maintenance and operation of public works and utilities (as well as the great general necessities like food, fuel and transportation) is to a large extent safeguarded by permanent employment, and certain compensation. The individuals all undertake this work voluntarily, are generally not subject to arbitrary dismissal, and are often eligible for some form of direct or indirect pension. If they have grievances, the public can be safely counted on for sympathy and eventual remedy.

These men are therefore emphatically in a class by themselves, with special privileges and special responsibilities, and are in every way bound to fulfill their trust and not to desert their posts, collectively, any more than the captain and crew of a ship at sea. Such strikes, especially like those of the railroaders and coal miners, may cause inconceivable suffering and damage, while strikes in the police, post office and fire departments, waterworks, and other great essentials would soon cause deaths, public paralysis and even anarchy. Yielding to such strikes is a national humiliation resulting in aggravated burdens to the citizen for the sake of political schemes and in a financial gain to a minute percentage of the population at the serious expense and distress of the remainder. Such strikes should be absolutely prohibited by immediate legislation and severe penalties provided for their punishment. If the Railroad Bill neglects to provide against strikes, it will be a national calamity.

Rational Selection of Costly Excavating Plant

The importance of selecting and installing construction plant and equipment so as to secure the greatest ultimate satisfaction, rather than to get a possibly greater limited maximum product or lower cost under temporary or uncertain conditions, is clearly brought out by the article on page 113, that describes the installation and operation of dragline excavating machines for a large amount of heavy rock work of a nature for which different methods and equipment are often used.

In this case about $25,000,000 is being expended on heavy construction intended to prevent disastrous effects from future floods in the Miami valley. In the last analysis, after taking into consideration all the conditions that could be foreseen as likely to influence the operation of the machinery, the balance was in favor of the simpler method and plant.

Much of the work was of a character where more rapidly operating and more powerful steam shovel equipment might have been expected to be capable of working at a lower cost. This advantage was not disproved, but it was believed to be limited and somewhat uncertain and to be offset by important disadvantages that were considered to outweigh it. While the dragline buckets are less powerful, and cannot work as positively nor handle material as rapidly as the large shovels, they possess greater flexibility of operation and installation; command very large areas without moving their positions; can be installed in working position more quickly and cheaply than the steam shovels; can be operated under water; have a far greater range of operation in excavating far below their own level and in delivering material far above it; do not require difficult and expensive installation, maintenance and operation of dump car trains; can be advantageously operated by electricity from a central plant; and they require a much smaller equipment of scarce, costly, and unreliable labor. They were also much less in danger from floods in localities inevitably subject to heavy freshets. These considerations fully justified the selection of the type of machinery which has there proved eminently satisfactory in service.

Prepare for Work in Time of Waiting

Efficiency spells, in capital letters, success, satisfaction, and prosperity. The vital element of efficiency is preparedness; and for all kinds of construction operations prime essentials of preparedness are organization, equipment, materials, plans and schedules.

Every constructor now knows the general character and amount of the work that he may do this year and whether or not it is already definitely ordered, or depends on future deveolpments and contingencies, he knows in a general way what the requirements should be, at least the vital ones. If he has not alrady made reliable definite plans to meet them, he should lose no time in doing so in the short period now remaining when operations are sidetracked by the winter season, and new work is not yet contracted for.

Important work should be carefully studied not only to determine the requisites for its execution, but, no less to find by expert anaylsis if reasonble changes in the design and specifications may not secure economies of time, labor and materials, that will richly repay both the owner and the constructor without detriment to the structure.

When these are determined promptly, the office organization, as well as the field personnel of superintendents, engineers, inspectors and principal foremen should be at least skeletonized and lines laid for securing skilled labor if any large amount of it will be required.

Most of all, it is necessary that all existing equipment likely to be used, should be thoroughly overhauled and put in the best working conditions and so far as practicable, tested in operation, and that orders should be promptly placed for all the new plant and machinery that are sure to be required,

Road Concreting Speed

One hundred and twenty-six feet of 16-foot pavement laid in one hour with two-yard mixer and special system for delivering and handling materials.

G. P. Scharl, contractor for 5 miles of 16-foot concrete road in Branch County, Michigan, has installed plant and methods of operation enabling him to handle the work in large units and with great regularity and continuity that have resulted in placing concrete at the rate of 55 cubic feet in about every 75 sec. and securing a maximum progress of 126 feet of finished pavement per hour.

Materials are delivered in cars shunted from the main line railroad track to a switch alongside the storage bins. Bulk cement is received in gondola cars covered with heavy canvas and is unloaded into a stationary elevated bin by a clamshell bucket suspended from the boom of a derrick car.

Each side of the cement bin is an elevated aggregate storage bin built on a flat car installed on a dead end track. The gravel and sand bins are filled from cars on the switch alongside by the derrick car which is self propelling and spots and shifts the cars on the switch.

The switch is long enough to accommodate sufficient cars to provide for ordinary interruptions in the railroad service and the bins are large enough to insure constant automatic supply to the service cars.

An industrial track alongside the storage bins is run to and parallel with the road construction, being shifted to keep pace with the progress of the mixer and being provided with facilities for shifting and returning the empty cars. Flat cars installed on the service track are each provided with a 55-foot capacity wooden material box, which is in effect a rectangular, bottom-dumping bucket with the flaps controlled by links pivoted to vertical slide bars.

A group of cars each carrying one empty box is pushed alongside the gravel bin and 30 cubic feet of gravel are discharged by gravity into each box. The cars are hauled to position alongside the cement bin, where each box similarly receives 10 cubic feet of cement. They are again hauled to the sand bin and the boxes are filled up with 15 cubic feet of sand each.

Beyond the sand bin the teams are replaced by a gasoline locomotive that hauls the train alongside the mixer. Here a locomotive crane mounted on traction wheels lifts the boxes successively by double pairs of chains attached to the vertical bars and to the sides of the boxes, swings the boxes over the charging hopper of the mixing machine and dumps their contents into the hopper by manipulating the vertical sliding bars which are controlled by a special device designed by the contractor and built in his field shop.

The special 12-ton mixer constructed according to the contractor's specifications, is mounted on wide-tire wheels that do not require plant tracks to be laid on the sub-grade. It is moved forward by the locomotive crane that unloads the service cars. When in regular operation the machine mixing each batch at least 65 sec. has concreted 700 linear feet of pavement per day with a maximum run of 126 feet per hour and an average of 70.4 feet per hour. The machine is supplied with water pumped by the contractor.

As the mixer advances the concrete is screeded with a steel bound template curved to the radius of the required crown and the surface is compacted and excess water flushed out by rolling. The transverse expansion joints are finished with a 4-foot split float, the longitudinal sides are worked with an edging tool and the wet concrete is covered with cannas and protected with 2 inches of wet earth applied not later than the morning of the day after concreting. All curves are widened and superelevated and the road is opened after 18 days.

Charles Warren Hunt

Appreciated and relieved after twenty-five years' faithful service as chief executive of American Society of Civil Engineers.

After 25 years of devoted and efficient service as secretary of the American Society of Civil Engineers, Doctor Charles Warren Hunt has been made Secretary Emeritus, at a salary of nine thousand dollars and has been granted a six months' leave of absence to recuperate his health.

During his notably efficient administration as chief executive officer of the great national technical society, its membership has grown from 1,808 in 1895 to 9,403 at the present time. The dignity and reputation of the society have kept pace with its prosperity and are due to no other individual so much as to Dr. Hunt whose high executive ability, financial judgment and unwearied devotion to the society were fully appreciated and relied upon by the Board of Direction, composed of its most eminent members, that have guided its policy.

In addition to the ethical and technical progress which have made this society a standard for high thinking and great doings many important improvements largely due to Dr. Hunt's initiative have been developed both in the conduct of the important business of the society and of the library and in its professional activities. Including, notably, the volume and character of the society's publications, the extremely important participation in the St. Louis National Engineering Congress of 1904, and the successive development of the society's quarters from the remodelled residence on 23rd street to its own building on West 67th Street, and later to the present quarters in The Engineering Society's Building that were designed expressly to take the utmost advantage of co-ordination between it and the other three great national societies.

Dr. Hunt is a civil engineering graduate of New York University and after sixteen years of active professional experience in construction and maintenance operations he commenced in 1892 a three years' service as assistant secretary followed by the 25 years of responsible office that has just terminated, and for which it will be hard indeed to find a successor of equal ability and devotion.

Annual Paving Statistics

Facts and figures from several hundred cities concerning the amount and nature of work done by each during 1919. (Third instalment.)

TABLE NO. 1—SHEET ASPHALT LAID IN CITY STREETS DURING 1919.

City and State	Yards or miles laid	Average cost per sq. yd.	Base: Kind	Base: Thickness, ins.	Base: Cost per sq. yd. or cu. yd.	Surface, thickness, ins.	Binder, thickness, ins.
California:							
San Francisco...	128,072	$2.05*	Concrete	6	...	...	...
Connecticut:							
Hartford	36,725	3.04	1:3:6 concrete	6	...	1½	1½
Iowa:							
Sioux City.....	20,000	4.23*	1:2½:5 concrete	5	...	1½	1½
Nebraska:							
Grand Island...	60,000	2.54*	1:5 gravel conc.	4	...	1½	1½
New Hampshire:							
Nashua	6,000	1.00§	Old macadam	...	...	...	2
New York:							
Buffalo	88,331	5.06†	Concrete	6	...	2	1½
New York–Bronx	46,100	2.50‡	Concrete	6	$8.00	...	...
New York–Manhattan	138,300	4.15	Concrete	6	2.77	1½	1½
Syracuse	6.59	2.00§	1:3:6 concrete	6	.90	2	1
Utah:							
Salt Lake City..	0.118	2.60	Concrete	6	...	1½	1½
Ohio:							
London	3,800	3.82††	Concrete	5	...	1½	1
Rhode Island:							
Providence	12,867	1.80§	Concrete & macadam	Conc. 6	1.55 & 1.10**	1½	1 & 1½
Washington:							
Seattle	5,786	...	.....	...	...	...	...

*Includes grading and base. †Includes grading, base, curb and improvement complete. §Includes asphalt surface only. ‡Includes excavation but not base. ††Includes base, curb and gutter. **City furnished screened gravel loaded in contractors' carts; cost city $0.533 per sq. yd.

TABLE NO. 3—GRANITE BLOCK LAID IN CITY STREETS DURING 1919.

City and State	Yards or miles laid	Average cost per sq. yd.	Base: Kind	Base: Thickness, ins.	Base: Cost per sq. yd. or cu. yd.	Kind of filler
California:						
San Francisco ..	902	*$4.13	Concrete	6	...	.....
Connecticut:						
Hartford	2,640	5.32	1:3:6 concrete	6	...	Cement
Massachusetts:						
Haverhill	6,894	†1.06	On old base	...	...	Cement grout
Lawrence	6,925	5.65	On old base	...	...	Cement grout
New Hampshire:						
Nashua	5,200	†1.25	On old base	...	...	Cement grout

TABLE NO. 2—BRICK PAVEMENT LAID IN CITY STREETS DURING 1919 —Continued.

City and State	Yards or miles laid	Average cost per sq. yd.	Base: Kind	Base: Thickness, ins.	Base: Cost per sq. yd. or cu. yd.	Depth of cushion, ins.	Kind of filler
Duquesne	4,640	3.35	Slag	8	...	2	Sand
Johnstown	39,461	4.285	1:3:6 concrete	5 & 6	...	1††	Pitch; cement
Texas:							
Temple	4,600	2.82*	Concrete	4	...	1	Asphalt
Washington:							
Seattle	30,123	3.85	1:3:6 concrete	6	...	Mono'th	Grout
Spokane	175	3.43	Concrete	5	...	¾	Grout
West Virginia:							
Huntington	18,213	4.24¶	Gravel	5	...	1	Sand
Moundsville	4,500	2.82	Gravel	6	...	2	Grout
Wisconsin:							
Wausau	13,000	3.50*	Concrete	5	...	1	Asphalt

*Includes grading. †Vertical-fiber brick. §Includes grading, base, curb, and improvement complete. ‡Brick surface only. ¶Includes curb, excavation and drainage. **Includes curb and gutter. ††1:4 sand-cement mortar.

TABLE NO. 6—BITUMINOUS CONCRETE LAID IN CITY STREETS DURING 1919.

City and State	Yards or miles laid	Thickness, inches	Average cost per sq. yd.	Base: Kind	Base: Thickness	Base: Cost
California:						
Pasadena	391	1½	$0.526	.....	..	I
Santa Barbara	79,235	..	*1.98	Concrete	4	I
Vallejo	8,600	..	1.89	Concrete	4	$0.855
Kansas:						
Topeka	26,000	2	2.75	Concrete	5	I
New Jersey:						
Ridgefield Park ...	9,800	2	†2.28	Macadam	4	0.85
New York:						
New York - Richmond	34,020	2	†2.72	Old base	..	....
Syracuse	1.13	2	†1.95	Concrete, 1:3:6	6	0.90
Oregon:						
Eugene	4,000	1½	2.55	Concrete	6	I
Utah:						
Salt Lake	1,018	6	2.75	Concrete, 4" crushed stone	4	I
Washington:						
Seattle	14,693	2½	2.55	1:3:6 concrete	5	I
Spokane	18,239	3	2.48	Concrete	5	I

*Includes grading. †Does not include base. I—Included in pavement cost.

New York:						
Buffalo	$6,286	¶6.43	Concrete	6	...	Cement grout
New York-Bronx	71,300	‡4.81	Concrete	6	$7.05	Grout or asphalt
New York-Manhattan	175,000	*7.02	Concrete	6	...	Asph. mastic
New York-Richmond	10,669	‡5.40	Concrete	6	1.49	.....
Troy	3,000	*3.40	1:3:6 concrete	6	...	1:1 cement grout
Pennsylvania:						
Duquesne	2,418	4.65	Concrete	6	...	Cement
Rhode Island:						
Providence	2,701	**3.13	Concrete	6	1.71	Cement grout
	4,420	3.14	Gravel	6	1.60	Cement grout

*Including grading. †Old blocks relaid. §Medina sandstone. ¶Includes grading, base, curb, and complete improvement. ‡Includes excavation but not base. **Does not include base.

TABLE NO. 4—MISCELLANEOUS PAVEMENTS LAID IN CITY STREETS DURING 1919.

City and State	Kind of Pavement	Yards or miles laid	Average cost per sq. yd.	Remarks
New Jersey:				
Irvington	asphalt block	11,057	$4.14	.....
New York:				
New York-Bronx	Durax block	15,000	5.25	relaid on old base
New York-Richmond	asphalt block	4,719	3.50	.....
Troy	recut granite block	7,800	3.50	on 6" base, sand cushion, grout filler
Texas:				
Port Arthur	Shell with 1" gravel top	16	0.698	natural soil foundation
Washington:				
Raymond	Resurfacing plank road	11,000	0.99	.....

TABLE NO. 2—BRICK PAVEMENT LAID IN CITY STREETS DURING 1919.

City and State	Yards or miles laid	Average cost per sq. yd.	Base: Kind	Base: Thickness, ins.	Base: Cost per sq. yd. or cu. yd.	Depth of cushion, ins.	Kind of filler
California:							
San Francisco	11,497	$3.57*	Concrete	4	...	...	.....
Kansas:							
Parsons	3,000	3.00	Concrete	4	...	1	Asphalt
Topeka	6,100	4.60	Concrete	5, 6 & 7	...	...	.....
Massachusetts:							
Pittsfield	18,165	4.30*	Concrete	5½	...	¾	Cement
Michigan:							
Kalamazoo	11,000	4.00	Concrete	6	...	1½	Asphalt
Minnesota:							
Duluth	1,077	3.90	Concrete	6	...	1	.....
Nebraska:							
North Platte	22,500†	3.66*	1:3:5 concrete	5	...	1½	Asphalt
New York:							
Buffalo	20,752	4.95§	Concrete	6	...	1½	1:1 grout
Syracuse	0.86	3.50‡	1:3:6 concrete	6	$0.65	1½	Grout
Ohio:							
London	1,414	5.30**	Concrete	12	...	1	Cement
Pennsylvania:							
Athens	3,144	2.58‡	Concrete	6	10.00	...	Grout
Butler	5,140	3.73	Slag	9	...	1	Pitch

TABLE NO. 5—CONCRETE PAVEMENT LAID IN CITY STREETS DURING 1919.

City and State	Yards or miles laid	Average cost per sq yd.	Number of courses	Thickness, inches	Proportions of mixture
California:					
Oxnard	40,362	*$1.62	1	4	1:2½:5
Santa Monica	3,845	1.359	1	4	1:2:4
Connecticut:					
Greenwich	20,200	2.25	1	5 and 7	1:2:4
Hartford	1,185	1.86	1	7	1:2:4
Illinois:					
Winnetka	59,083	2.60	1	6 and 10	1:2:3
		2.75	1	6 and 11	
		3.00	1	6 and 12	
Iowa:					
Atlantic	5,000	2.94	1	6	1:3:4
Centerville	2,000	†3.81	1	6	1:2:3
Alton	30,165	†2 47	1	6	1:2½:4
Sioux City	52,600	†3.25	1	6	1:2½:4
Kansas:					
Topeka	6,000	2.50	1	6	1:2:4
Maryland:					
Hagerstown	1,600	....	1	8	1:2:4
Massachusetts:					
Greenfield	4,400	§3 62	1	6 and 8½	1:1½:3
Pittsfield	35,400	†3.00	1	7 and 9	1:2:3
Minnesota:					
Duluth	34,726	....	1	7	1:1½:3
New Hampshire:					
Nashua	700	2.00	..	....	1:1½:3
New Jersey:					
Irvington	21,427	2.40	1	6	1:2:3
New York:					
Depew	36,000	‡4.50	1	....	1:1½:3
Gloversville	20,000	¶2.65-2.95	1	6	1:2:3
New York - Richmond	30,156	†2.66	1	6 and 8	1:2:4
Troy	11,000	†3.23	1	7	1:2:4
Waverly	540	2.155	1	6	1:2:3
North Dakota:					
Bismark	29,000	3.20	2	Base 5, top 2	Base 1:4½; top 1:2:3
Oklahoma:					
Enid	18,300	2.69	1	6 and 8	1:2:3
Oregon:					
Eugene	4,000	2.40	1	5½ and 6½	1:2:3
Pennsylvania:					
Butler	747	....	2	6	1:2:4
Johnstown	9,041	3.041	1	6 and 8 or 9	1:2:3
Northampton	871	2.08	1	6 and 7½	....
South Carolina:					
Columbia	3,600	3.00	1	7	1:2:3
Utah:					
Salt Lake	1.97	2.75	1	5 and 6 to 7	....
Virginia:					
Newport News	13,000	....	2	Bottom 6, top 2	Bottom 1:3:6; top 1:1½:3
Washington:					
Chehalis	1,263	2.12	1	6	1:2:3
Dayton	9,000	2.75	1	6	1:2:3
Raymond	4,680	2.49	1	6½	1:2:3
Seattle	109,426	1.80	1	6	1:2:3½
		2.04	1	7	
		2.48	1	8	
		2 68	1	9	
Spokane	646	2.30	1	6	1:2:3
Winlock	10,000	2.08	1	6	1:2:4
West Virginia:					
Fairmont	5,400	2.70	1	6 and 8	1:2:4

*Grading averaged 18 cents per sq. yd. additional. †Includes grading. §Done by town forces; concrete cost, $9.03 per cu. yd. ‡Includes grading, curb and drainage. ¶Includes excavation and reinforcement.

Road Improvement by Citizens

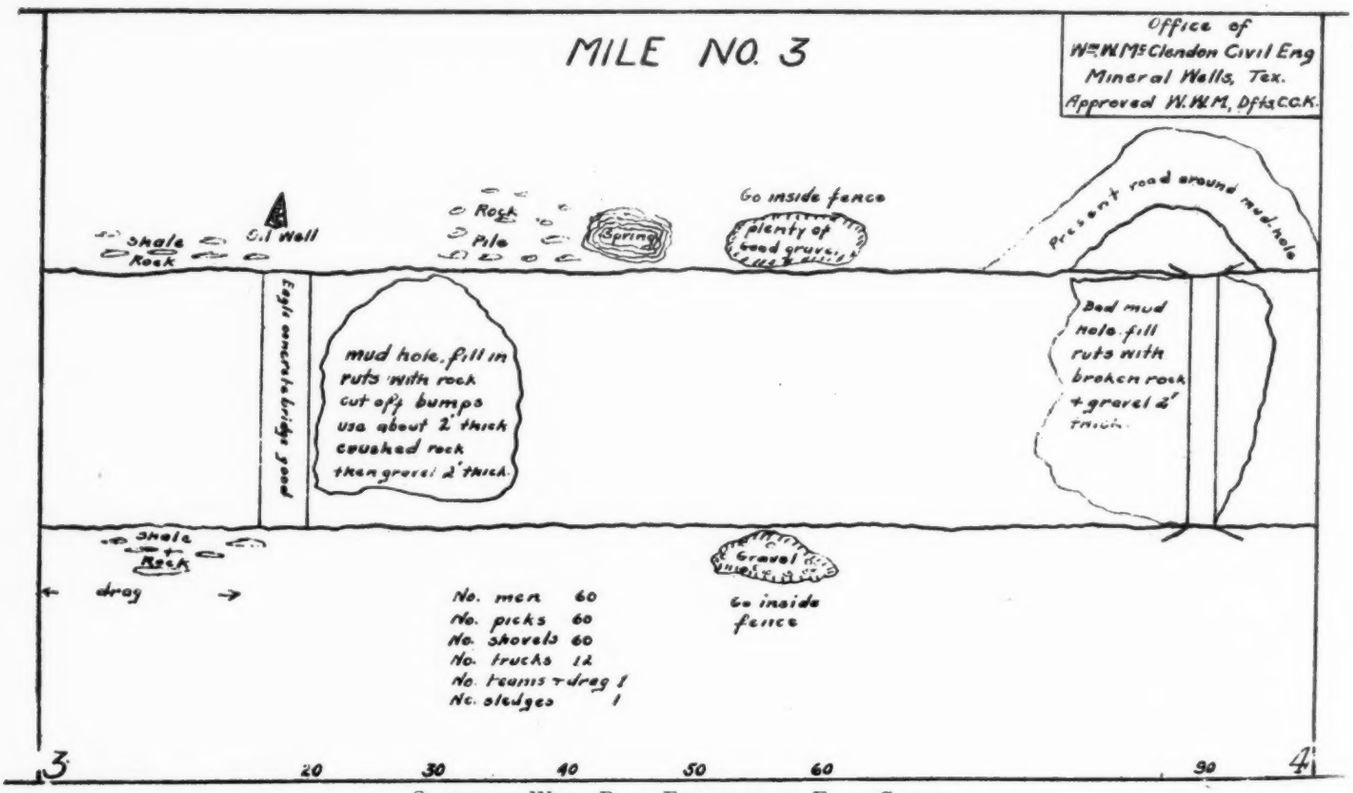
An unpaid citizen force of 1,270 men put in repair 35 miles of road which had been carefully mapped in 350 sections, with men, materials and equipment distributed on them by careful estimate.

Mineral Wells, Texas, a town of 10,000 population, is in the midst of the Texas oil fields, 54 miles west of Fort Worth. With the oil boom during the past two years the town has grown several fold in population, and the traffic on the roads leading to it has increased even more rapidly, a large part of this consisting of motor trucks. One of these roads, leading from Mineral Wells to the Stephens county line, a distance of 35 miles, carries traffic which a count made recently showed to average 67 vehicles an hour for 10 hours of the day, of which 45 per cent were trucks, the average load of which, excluding the weight of the truck, was 5 tons. This road was not originally intended for such a traffic nor was the county provided with a sufficient maintenance fund to maintain it, and by the summer of 1919 it had become almost impassable.

To improve this condition, the citizens of the town and the oil companies together raised $10,000 to be used in improving this road, to which sum was added $10,000 from the county and $20,000 from the state highway commission. A survey of the road by County Engineer M. V. Smith, however, showed that it would cost much more than $40,000 to put even the first ten miles in condition, the drainage structures alone averaging 3½ culverts and 3 bridges of not less than 20-foot span per mile. Estimate showed that the permanent construction provided for by this fund would be limited to a 4-mile stretch, leaving 18 miles still in a bad condition.

Sentiment in the county was found to be against a county bond issue, and the organization of a "shoestring" highway district was found to be illegal. In this emergency, the Chamber of Commerce originated the idea of a "good roads working day," and a canvas of the local business men resulted in all of them favoring the idea and being willing to close their places of business on such a day. William W. McClendon, city engineer of Mineral Wells (to whom we are indebted for this information), a paving contractor, and two other citizens, undertook to organize the work, the day being set as October 23rd. Mr. McClendon, County Engineer Smith and P. E. Beck (an engineer and manager of the Chamber of Commerce) examined the road for a distance of 35 miles from Mineral Wells, dividing it into one-tenth-mile sections and using an automobile cyclometer for measuring distances.

In making this survey, a note was made on the ground of every chug hole and mud hole, of good and bad



SAMPLE OF WORK PLAN FURNISHED TO EACH CAPTAIN.

bridges and culverts, and where suitable road material (including gravel pits) could be found within three miles of the road. The approximate amount of material required for each mile section was estimated. This information was recorded on plans, there being 35 of these, each 12 inches long and 6 wide and each representing a single mile of road. Knowing the amount of work to be done in each mile section and that this work was to be done in one day, calculation was made of the exact number of men, teams, trucks, picks, shovels and other equipment necessary for each mile section. These facts and calculations were entered on the sheets, together with notes indicating the nature of the work to be done.

Blue prints of these sheets were made and bound into several books which were turned over to the committee for approval. Following this, a list was made of all available men, with their addresses and phone numbers, also of teams, trucks, picks and shovels, etc. It became evident at the outset that sufficient teams could not be obtained in Mineral Wells for working the further sections of the road, and another committee was appointed to solicit the use of teams from residents along the road. A captain was then selected for each mile of road and furnished with a list of the carpenters, laborers, teams, trucks, picks and shovels which he would need and where he was to obtain them. The captain was held responsible for notifying his men and securing his equipment. He was furnished with a blue print of his mile of road and was supposed to see that the work indicated was performed.

VOLUNTEER WORKERS ON ROAD AT MINERAL WELLS, TEXAS.

The fire chief of Mineral Wells agreed to blow the fire siren at five in the morning of October 23rd so that every man might be up and on his section of road by eight o'clock. That day opened with a heavy rain, however and the work was postponed a week and for the same reason postponed twice again; but on Friday, November 21st, the weather permitted the work to be performed. Mr. McClendon and his partner, A. B. Purnell, acted as general supervisors of the entire 35-mile stretch. The organization worked very smoothly and the work planned was completed in almost every section before the day ended. In one section 20 carpenters, under the captaincy of a local contractor, tore out and rebuilt a bridge of 10-foot span 6 feet high and 18 feet wide in one and a half hours, including setting in new posts and filling in approaches.

All business was suspended during the day, even to the cafes, and the full organization as originally planned turned out. This included 1,270 men, 1,000 picks and shovels, 175 trucks, 110 teams, 3 tractors, 4 graders, 6 road drags, together with post-hole diggers, sledges and other tools.

Spots that were impassable the day before were carrying 10-ton loads the day following, and the trucks encountered a hard surface where there had previously been boggy mud holes, and crossed the streams over 12 new culverts and 8 new bridges.

The appreciation which the work received from the people generally was manifested by an appropriation by the Chamber of Commerce of a maintenance fund of $2,000 a month to maintain the improvement by the patrol system. A vote of thanks was extended to Mr. McClendon for his services, to which it was stated that 90 per cent of the day's success was due; and a further motion was made that a day in December be set aside to work another road leading to the north, the same committee being placed in charge.

If the second venture is as successful as the first it will lead the officials of Mineral Wells to continue this idea of citizen co-operation until all roads in the vicinity are suitable for the traffic they are now carrying.

With the necessity for better roads and the speed by which they can be obtained held constantly before the citizens it will be a very short time until the roads of Mineral Wells are as good as any in the immediate and neighboring vicinities.

INCREASING PRODUCTION BY TRAINING.

The Department of Labor is contemplating the establishment of a United States Training Service for the purpose of furnishing manufacturers with training courses, enabling them to instruct their employes in new and modern methods of increasing production and output and decreasing costs. The reason for this is that, for want of training, the output of practically 7,000,000 of the 10,000,000 workers in manufacturing in this country is said to be equal to an average production of less than 50 per cent of what it can be made by proper and intelligent training in the various lines.

The effect of this training, system and energy even in such ordinarily unskilled work as saw mill operation is demonstrated by the record of a mill at Tupper Lake, N. Y. Here, skilled and expert sawmill men in the summer season alone equal the output of lumber and pulpwood that would be considered quite a comfortable full year's work for many plants using ordinary unskilled labor. A short time ago this crew cut 2,303 spruce logs in nine hours and twenty minutes, using two saws making the cut on an 8-foot band mill running 10,500 r.p.m. The logs were all spruce from 12 to 16 feet in length; no cut was made over 10 inches in width, and all were cut to 1¼ inch lumber. This is said to be a world's record. When the mill was built a few years ago its cutting capacity was to be 60,000 feet a day but with the expert crew it now has the daily cut rarely falls below 100,000 feet, which means an average of 2,000 logs every day.

House Heating by Electricity

The Public Utilities Commission of Idaho investigated the practicability of this for that state and concluded that it would never be feasible, practicable or economical, and such use of electricity would be extravagant and wasteful.

The Hydro-electric Power Commission of Ontario about a year ago published a report on heating houses by electricity in which it demonstrated the improbability that this would ever be done economically. The Public Utilities Commission of Idaho began to investigate the same subject about a year ago, hearings being held by the commission for nine days in December, 1918, and under the date of October 17, 1919, issued its report on the subject in a volume of 576 pages.

In two districts in Idaho there had been a certain amount of heating of houses by electricity, which had given rise to a consideration of the subject by communities throughout the state. The Minidoka government reclamation project heats houses in five towns at very low rates, averaging 66 cents per k.w. per month during the heating season. But here hydro-electric power is used for irrigation pumping during the summer, and the plant would be idle during the winter if not used then for some other purpose. The heating rate includes practically no overhead expense or fixed charges, and will be raised about 50 per cent next March, which will bring the cost of heating to somewhat above that by use of coal. Even here, heating has been discontinued during the early spring, when irrigation pumping begins.

It was generally conceded that it would not be practicable to use electricity generated by steam for house heating in competition with coal, for in electric heating only about 13½ per cent of the heat of the coal would be utilized, while 40 to 50 per cent would be utilized in coal heating.

It was assumed that an average six-room house in the southern part of Idaho would require 7 tons of coal a year for heating at an efficiency of 50 per cent, which heating would require about 25,000 kw.h. of electricity. The average demand would be 9.3 kw., but a much larger installation would be required to heat the house comfortably during extremely cold weather, which excess demand would be met by heat from stoves or furnaces. (In 105 houses heated electrically in the city of Twin Falls, all but six have such provision for supplemental heating.)

The Idaho Power Co. serves a district with about 100,000 population, or 20,000 homes. Allowing 25 per cent for losses in transmission, distribution, etc., to heat these homes electrically would require an installation of 258,000 kw. The total installed capacity of all present hydro-electric plants in southern Idaho is about 75,000 kw. and it is estimated that it would take all of the water power feasible for development in the state to heat about 77,000 homes, which is much less than the present number of homes in the state. Similar studies in Spokane, Wash., and in Toronto, Ont., Canada, showed that an extraordinary capacity, greatly beyond the present hydro-electric development, would be needed for house heating alone, and this would furnish a load only about seven months in the year, leaving an extremely large plant development idle during some five months.

To heat the average six-room house with seven tons of coal annually at $10 per ton costs $70 a year. The cost of electric heating would be, under the most favorable conditions, at least four times greater, and, by the testimony of Prof. H. V. Carpenter, this cost would be about $444 a year. Allowing for the fact that large additional installation would be required for proper heating, it is concluded that electric house heating would cost from six to nine times as much as coal in southern Idaho.

(The Ontario commission, for a colder climate, found 39,700 kw. h. of electricity needed for heating an eight-room house for a winter season, costing $1,191, or $397 at the low rate of one cent per kw. h.; while the same heat could be obtained by coal heating for $90.)

It was shown in the testimony that the heating of 15,000 homes in the district of the Idaho Power Company would save about 100,000 tons of coal annually, whereas a smaller amount of electrical energy would serve to electrify the entire system of one of the trunk line railroads in Idaho, with a resulting saving of about 1,000,000 tons of coal annually.

The findings and conclusions of the commission are substantially as follows: "Having made an earnest effort to secure all the light possible on the subject . . . we find no grounds for holding out to the people of Idaho a reasonable hope that electricity will ever be used generally for house heating in our state, and we are forced to the conclusion that the use of electric energy for house heating in Idaho in competition with coal is neither feasible nor practicable and would be unprofitable to any producers who might undertake to furnish the service; and, further, that so long as there remains a field for the use of electric energy as motive power, its use for house heating is extravagant and wasteful." These conclusions were reached by Commissioners A. L. Freehafer and George E. Erb, and were concurred in by Commissioner E. M. Sweeley, who was not a member of the commission when the investigation was begun.

City Sells $10,000 Garbage Grease.

Dayton, O.—Two cars of garbage grease, bringing a little more than $10,000, have been sold to the Fairbanks Soap company of St. Louis by the city garbage reduction plant, according to a statement by service director H. P. Martin. The cars will total about 120,000 pounds, at 9¾ cents per pound, and are to be delivered in February and March. The sales of by-products from the garbage plant netted the city $28,000 in 1916, 1917 and 1918, it was stated, in addition to paying operating expenses, sinking fund and the interest on the investment.

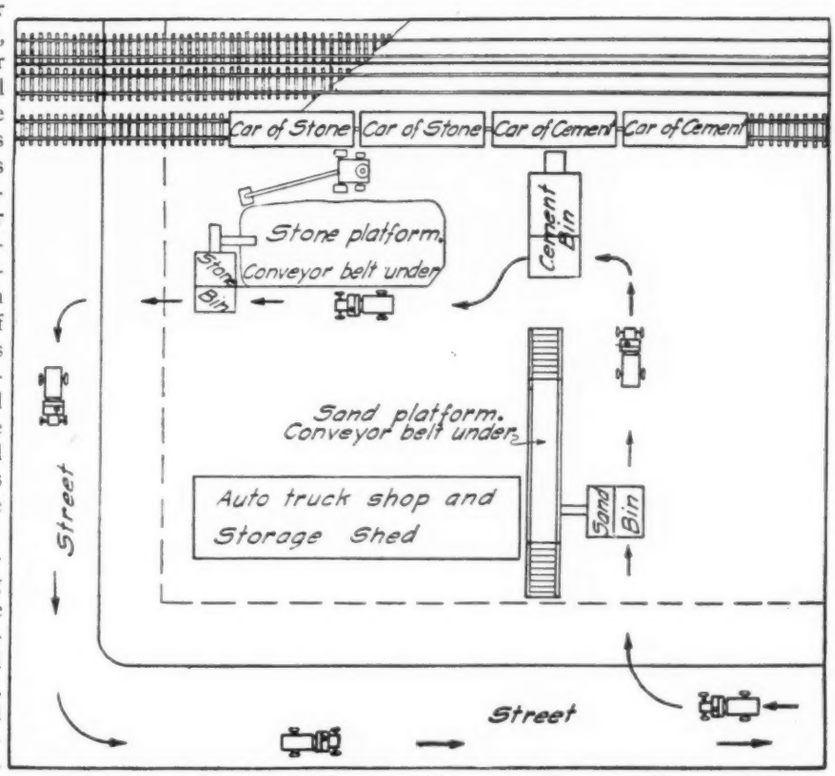
A set of four 48-inch corrugated culvert pipes 80 feet long were assembled complete on shore, fitted with automatic swing gates at one end, and quickly set in position in a drainage ditch between guyed piles by means of the boom of the floating dredge equipment that placed them under water 11 feet deep at low tide. This method utilized easily available equipment and avoided construction of an expensive and perhaps troublesome cofferdam.

A Systematized Concrete Paving Job

Bulk cement and aggregate delivered by railroad to storage plant equipped with electric unloading and conveying machinery. Materials loaded by gravity from bins to fleet of motor trucks transporting them a mile or more to mixer.

A job of concrete paving for which the construction details were carefully planned and carried out by the contractors, J. S. McLaughlin & Sons, of Red Oak, Ia., was carried out this summer at Spencer, Ia. The contract was for 95,865 square yards of concrete paving.

The work was about a mile from the railroad siding, and it was decided to store the materials in bins at the siding and haul them to the mixer on the job. As in so many other instances last year, scarcity of labor was anticipated and realized, and use was made to as great an extent as possible of mechanical equivalents for labor. The contractors also realized that with an extensive use of machinery there is likely to be breakdowns which will delay or tie up the entire work, and every effort was made to minimize these.



SKETCH SHOWING LAYOUT OF MATERIALS PLANT AND ROUTE OF TRUCKS THROUGH THE PLANT FOR LOADING.

While the subgrade was being prepared, three bins, one for cement, one for sand and one for stone, were being erected alongside the railroad siding. The cement was received in bulk, the stone by rail, and the sand was hauled from local sources in 5-ton motor trucks owned by the contractor. A shop was erected where quick repairs could be made of trucks and other parts of the equipment. The stone was removed from the gondola cars by a crane with a clamshell bucket, which deposited it in a wooden funnel, which in turn discharged it upon a conveyor belt and this dropped it into the buckets of a bucket elevator, by which the stone was lifted and discharged into the stone bin. The sand was dumped by the trucks into a funnel below the platform onto which they were run, and discharged into the sand bins in the same way as was the stone. On the underside of both sand and stone bins were measuring boxes through which the aggregate passed by gravity into the trucks, which were driven directly under the measuring boxes.

Bulk cement was delivered in freight cars, which were unloaded by a power-driven scoop, the cement carried to the top of the bin by bucket conveyors, and measured in a box on its way by gravity from the bin to the truck. Electric motors supplied the power for operating all of this apparatus.

These materials were hauled from this loading plant to the mixer by ten Ford trucks. Each truck first received a measured amount of sand, then of cement, and finally of stone and, traveling an average distance of a mile to the mixer, then discharged the entire material into the skip. This mixer had a capacity of 28 cubic feet per batch, and the trucks carried 24 cubic feet. The concrete was proportioned 1-2-3, giving a cement content of 1.7 barrels per cubic yard. Checking the amount of cement used in the first 13,000 square yards, it was found that this exceeded the amount specified by approximately 2 per cent.

The average run for a 10-hour day was 1,200 square yards of finished pavement, but as high as 1,580 square yards was made in a day; this including an integral curb along each side of the pavement, and the reinforcing of the pavement with steel rods. The roller and belt method of finishing was employed.

Including the loading plant, the paving gang and the trucks, 47 men in all were employed. The loading gang comprised one foreman, one mechanic, two men at the stone bin, two at the sand bin and three at the cement bin. Two machine operators handled the crane and there was a driver for each of the ten Ford trucks. The concrete gang included a foreman, two mixer operators, two men at the skip, two at the chute, three concrete spreaders or graders, two placing the steel reinforcing, five performing the finishing operations and two on the roller and belt. Five men were employed in covering the finished pavement with earth and keeping it wet, and removing the forms, and two helpers were assigned to miscellaneous duties.

The Santa Monica pier was built ten years ago with concrete piles, many of which have become so badly cracked and disintegrated that the engineers recommend replacing them with creosoted wood piles, caps and struts.

LEGAL NOTES

A Summary and Notes of Recent Decisions—

Firemen's Unionism Declared Illegal.

Pittsburgh, Pa.—It is illegal for any municipal employe to be affiliated with a labor union according to a report submitted to council by city solicitor C. A. O'Brien in response to a resolution requesting the information. It was said the city firemen belong to a union. In his legal opinion, solicitor O'Brien cited the instances of the recent strikes of police officers in Liverpool and Boston as furnishing most cogent of all arguments against the unionizing of these forces or "permitting them to have any outside affiliation or control which interfered with strict adherence to their duty to the public and obedience to the superiors charged wih the supreme obligation of maintaining public peace and order." He stated that the system established indicates that the legislature intended to make city firemen free from outside interference or influence.

Tuberculosis Hospital Not a Nuisance—Injunction Suit by Citizens.

(La.) Citizens and taxpayers have no right of action to enjoin city from creating a board of trustees for tuberculosis hospital, or putting a woman upon the board, or accepting donation for construction of building and maintenance of hospital, since they have no interest therein.—Le Bourgeois v. City of New Orleans, 82 So. 268.

Citizens and taxpayers in their capacity as such may sue to enjoin city from transferring funds and property of city to a private institution.—Id.

In suit to enjoin city from constructing and establishing tuberculosis hospital, evidence held to show that a well-kept tuberculosis hospital is not a menace to the health of the people living in its vicinity.—Id.

In suit to enjoin city from establishing and maintaining tuberculosis hospital, evidence held to show the hospital an imperative necessity.—Id.

A tuberculosis hospital 600 feet removed from a residence is not a nuisance to the people living in the residence.—Id.

Citizens and taxpayers in their capacity as such have no right of action to abate a public nuisance, but must sue in their individual capacity for impairment of indivdual rights.—Id.

Zoning—Validity of Ordinance—Prohibition of Obnoxious Occupations.

(Cal. App.) For the purpose of regulating occupations causing noise or offensive odors, city may divide its territorial limits into residence and business districts, and prohibit the keeping of a livery stable or corral for the keeping of horses, mules, etc., for hire, in residence district, and requiring a permit for maintenance thereof in business district, is not arbitrary.—Id.

In action by keeper of burros and mules for hire to enjoin city from enforcing ordinance prohibiting maintenance of corral for mules and burros in residence district, and requiring permit, for maintenance thereof in business district, it is not material that plaintiff may have kept his corral as clean as possible, and carried on his business in the most approved manner, or that it would be possible for one or more corrals to be maintained without an appreciable risk or peril to the health or safety of a community.—Id.

It is for the city's legislative body, clothed with police power by direct grant from the Constitution, to determine when and what regulations of a business are essential, and its determination will not be disturbed by the courts unless the regulation has no relation to the protection of health, safety, comfort, or well-being of the community, but is a clear invasion of personal or private rights under the guise of police regulation.—Id.

The exercise of police power by a city is not limited to the regulation of such things as already have become nuisances, or have been declared such by judgment of a court, but extends to everything expedient for the preservation of the safety, health, or comfort of the city's inhabitants.—Id.

A municipality has power by ordinance to divide its territorial limits into business and residence districts, and to prohibit in the residence district the maintenance of any corrals wherein mules and burros are kept for hire; the keeping of such corrals in a populous city or town being a nuisance.—Id.

Whenever a thing or act is of such a nature that it may become a nuisance, or may be injurious to the public health or obnoxious to the comfort of a community if not suppressed or regulated, the legislative body in the exercise of its police powers may make and enforce ordinances to regulate or prohibit it, although it may never have been obnoxious or injurious in the past.—Id.

Occupations which by the noise made in their pursuit or the odors they engender are offensive to the senses may be interdicted by law in the midst of populous communities on the general and rational principle that every person ought so to use his property as not to injure his neighbors, and that private interests must be made subservient to the general interest of the community.—Id.

"Western" Concrete Road Plant.

Catalog 45 of the Western Wheeled Scraper Co. is devoted to standard equipment for concrete road construction. It contains illustrations and descriptions of elevated wooden storage bins for aggregate and cement which are made in sections that can be shipped on flat cars and installed alongside the railroad track, where they are filled by means of a derrick or other elevating devices and deliver through bottom valves or gates to cars run on an industrial railway track laid on the surface of the ground under the bins.

Steel or wooden 1-yd. batch boxes for measuring and conveying, the sand, gravel and cement, are provided with bottom flaps held shut by chains passing up through the box, over the edge, and connected to outside levers locked in position by pins. One or two of these boxes are placed on each flat car, filled underneath the bin and hauled to position, where they are hoisted and swung above the charging hopper of the concrete mixer. The pins are then removed, releasing the levers and permitting the doors to open by gravity, discharging the contents of the buckets into the hopper and thus insuring rapid operation and exact proportion. Another type of batch box has the bottom flaps controlled by a second hoisting line.

The catalog also lists industrial tracks, flat cars, steel side-dump cars, and gives several diagrams with explanatory notes showing the arrangement and operation of track and equipment for handling aggregate and cement between storage and mixer and maintaining continuous operations with clearance between full and empty cars when the track is laid on subgrade or on a berm outside the roadway from where either one or two mixers are employed and when the concrete is laid towards or away from storage. Another diagram shows, a convenient arrangement of railroad siding, storage bins, box piles, unloading derricks and industrial railway.

Change of Grade—Benefits and Damages.

(N.Y.Sup.) The statutory provision requiring commissioners to ascertain the value of any benefits to the property in consequence of the alteration of the grade of the street does not confine the abutting landowner's damages to the condition immediately following the change of grade in its narrowest sense, but contemplates the condition existing when the work involving the alteration and change of grade is reasonably completed.—Rogers v. Village of Cato, 177 N. Y. S. 470.

NEWS OF THE SOCIETIES

Feb. 25.—NEW JERSEY SEWAGE WORKS ASSOCIATION. Annual meeting, Trenton, N. J. Secretary-treasurer, Frederick T. Parker, Guarantee Trust Bldg., Atlantic City, N. J.

Feb. 26-27.—MATERIAL HANDLING INDUSTRY. Annual Convention at New York. Secretary, Zenas W. Carter, 35 West 39th street.

Feb. 26-28.—SOUTHERN APPALACHIAN GOOD ROADS ASSOCIATION. Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

March 8-9.—INDIANA SANITARY AND WATER SUPPLY ASSOCIATION. Annual Convention at French Lick, Ind. Secretary-Treasurer, L. R. Taylor, French Lick, Ind.

March 10.—VERMONT SOCIETY OF ENGINEERS. Meeting and convention at Burlington Vt. Secretary, George A. Reed, Montpelier, Vt.

March 16-18.—AMERICAN RAILWAY ENGINEERING ASSOCIATION. Manhattan Building, Chicago.

March 24-25.—NATIONAL FEDERATION OF CONSTRUCTION INDUSTRIES. The first annual meeting at Chicago. Executive Secretary, John C. Frazee, Drexel Building, Philadelphia, Pa.

April 12-17.—UNITED STATES GOOD ROADS ASSOCIATION. Eighth Annual Convention, Hot Springs, Ark. Director-General, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

April 16-17.—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

May 10-11.—AMERICAN ASSOCIATION OF ENGINEERS. Sixth annual convention, St. Louis, Mo. Secretary, C. E. Drayer, 63 East Adams Street, Chicago.

May 18-21.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Pasadena, Cal. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

June 21-25.—AMERICAN WATER WORKS ASSOCIATION. Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71st street, New York City.

Oct. 4-8.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln avenue, Valparaiso, Ind.

American Association of Engineers.

Figures compiled by the American Association of Engineers from the reports sent in from the thirty-seven chapters and clubs who competed in the local publicity contest show that enough newspaper publicity has been obtained in the last four months to make up two complete editions of the Chicago Tribune. The contest closed on December 31.

The Globe-Miami, Ariz., chapter was the winner of the contest with a total of 438 column inches, or almost three solid pages, to its credit. The Toledo chapter was second with 430 column inches, and the Baltimore chapter third with 359. Butte, Mont., St. Louis, Cincinnati, and San Diego, Calif., held the next four places.

The contest was announced only late in August and the results were inconsiderable for September, but the monthly amounts increased thereafter. A great deal of publicity was obtained which was not entered in the contest.

At the sixth annual convention of the association, to be held in St. Louis on May 10 and 11, chapters and clubs of the association will enter displays of publicity obtained since the 1919 convention.

Associated General Contractors of America.

The annual meeting was held at the Hotel Morrison in Chicago, Feb. 18 and 19, and it included a national conference Thursday afternoon, Feb. 19, that was divided into four sessions—namely, for building contractors, highway contractors, railroad contractors, and public works contractors. These four sessions were found to be especially interesting in Jurisdictional Awards, Estimating Expense, the Joint Labor Agreement, Contractor's Relations with State Highway Departments, the Reconstruction of Railroads and in the Jones-Reavis Bill to create a National Department of Public Works and the proposed budget system for Government expenditures.

During the convention special attention was paid to the labor question, which was considered from every standpoint for the purpose of formulating principles that will operate to simplify the construction industry and advance its economy and efficiency.

Another very important and timely subject is that of Contract Forms, the advantages and disadvantages of cost-plus contracts, and the part that the association will take in establishing standard forms.

In order to develop most potently a virile leadership for all general contractors' interests, the activities, results and future course of the association were presented and discussed and the ultimate form of organization was studied, with special reference to whether the Associated General Contractors of America shall become an organization of individual firms and corporations; an organization for stimulating and assisting local chapters of general contractors; a federation of national and regional association of general contractors interested in different types of construction; or whether it shall adopt the ideal plan of a great national service including all the factors in one association. These questions were thoroughly discussed and the revised constitution and by-laws ratified.

Important reports from the committees on labor and on contracts and on other current subjects were presented, and good fellowship was promoted by the smoker and entertainment, Feb. 18, and the annual dinner, Feb. 19.

Indiana Engineering Society.

At the annual meeting in January the following officers were elected: President, Wm. T. Titus, Indianapolis; vice-president, O. C. Ross, Indianapolis; secretary, Charles Brossman, Indianapolis. Trustees: D. D. Ewing, Lafayette; A. P. Melton, Gary; John W. Fulwider, Lebanon; Frank C. Wagner, Terre Haute; Edwin S. Pearse, Indianapolis.

American Institute of Engineers.

The Detroit Chapter has elected P. W. Keating, president; J. S. Lillie, first vice-president; P. C. Handyside, second vice-president; E. L. Brandt, secretary, and J. T. Southern, treasurer.

Engineering Institute of Canada.

The thirty-fourth annual meeting was held in Montreal, Jan. 27-29, 650 present. It was announced that the number of its branches has been increased to eighteen, all of which are prospering, with a total membership of 3,657 on Dec. 31. The Gzowski Medal was awarded to Phelps Johnson, George H. Duggan and George F. Porter for their paper on the "Design and Construction of the Quebec Bridge." Officers for 1920: President, R. A. Ross, Montreal; vice-president, Brigadier-General C. H. Mitchell, Toronto, and W. G. Chase, Winnipeg; directors: F. B. Brown and Julian C. Smith, Montreal; A. R. Decary, Quebec; F A. Bowman, Halifax; J. B. Challies, Ottawa; E. R. Gray, Hamilton; Guy C. Dunn and B. S. McKenzie, Winnipeg; J. R. Macredie, Moose Jaw; George W. Craig, Calgary, and H. M. Burwell, Vancouver.

The American Road Builders Association.

In the 17th annual convention at Louisville, Feb. 9-13, the principal papers presented and subjects discussed included:

Co-operation between Engineers and Contractors in the Execution of Highway Programs.

Modern Plant and Equipment for Highway Construction.

Status of State Aid to Counties, and Its Future Development.

Should the Township and the District Board be Abolished as Road Construction and Maintenance Units?

Is State Supervision of the Construction and Maintenance of All Highways Desirable?

What Part of the Total Cost of Highway Construction and Maintenance Should the Motor Vehicle Be Expected to Bear?

Factors Which Will Limit Highway Construction During the Coming Season: (a) Car Supply and What Can Be Done to Overcome the Shortage? (b) Materials, The Development of Local Supplies and Increasing the Output of Existing Plants; (c) Labor, How Can Supply and Efficiency Be Increased?

The Fundamentals of Early Highway Construction; and Are We Neglecting Them?

What Are the Fundamentals of Modern Highway Construction?

New Highway Tests Being Made by the Bureau of Public Roads.

For What Grade of Construction Should Federal Aid Funds Be Expended?

New Developments in Proper Construction of and Bad Practice Which Should Be Eliminated in Concrete, Brick, Granite and Wood Block, Bituminous Penetration, Bituminous Mixed and Surface-Treated Macadam and Gravel Pavements.

Southern Appalachian Good Roads Association.

The convention will be held in Asheville, N. C., Feb. 26-27-28, and will give special attention to a state wide system of roads especially adopted for automobiles and heavy motor trucks. Gov. Thomas W. Bickett has made appointment of the following official delegates:

A. P. Lindsey, Gastonia; William Bradford, Huntersville; Eugene Transon, Sparta; Bennehan Cameron, Stagville; Bion Butler, Southern Pines; J. M. Boyette, Albemarle; N. B. Mills, Statesville; A. S. Patterson, Bryson City; W. T. Lindsey, Tryon; R. C. Mensies, Hickory; R. L. Ballou, Jefferson; J. W. Ragland, Newland.

National Association of Railroad Tie Producers.

The first annual convention was held at the Sherman Hotel, Chicago, February 12 and 13 and was presided over by President J. W. Fristoe. Routine business was transacted, official reports were made, officers were elected for the coming year, and the program was concluded by a formal banquet.

PERSONALS.

Newell, Professor F. H., president of the American Association of Engineers, has been appointed a member of the United States Chamber of Commerce Committee to consider a local Chamber of Commerce referendum of the National Department of Public Works movement.

Mr. Hall, of the Westinghouse Electric and Manufacturing Company, lectured recently in Detroit to the American Institute of Electrical Engineers and to members of the American Society of Mechanical Engineers on the design and application of electrical equipment for submarines, illustrating the subject with lantern slides.

Bass, A. S. S., Professor F. H., of the University of Minnesota, led a discussion on city planning at the annual meeting of the Minneapolis Engineering Club, January 19.

Fowler, Charles Evans, has opened an office in Detroit as chief engineer of the $28,000,000 Detroit suspension bridge about to be built there.

Carntherz, W. S., has been appointed county highway engineer of Sacramento County, California.

Winslow, George R., has been appointed division engineer of the California Highway Commission at Sacramento.

Thompson, Carroll R., has been promoted from principal assistant engineer to assistant director of the department of wharves, docks and ferries, Philadelphia.

Graff, Major B. H., has been appointed division engineer of the first district of the Georgia State Highway Commission.

McMillan, E. H., has been appointed road engineer for Gilmer County, West Virginia.

Platt, J. F., formerly of the Chicago, Milwaukee and St. Paul railroad has been promoted to chief engineer of the Wyoming State Highway Department.

Parker, Arthur, has been made chief engineer of Cheyenne, Wyoming.

Slade, Green, has been appointed highway engineer 10th Congressional District, Ga., with headquarters in Augusta.

Koller, Orion, will continue alone the business of the engineering firm of Koller & Conrad, Wheeling, W. Va.

Conrad, Harry, has been appointed City Engineer, Wheeling, W. Va.

West, C. W., has been appointed engineer for the Houghton Co. Road Comm., Virginia.

Garrett, Geo., has been appointed city engineer, La Grange, Ore.

McCluskey, N. M., has been appointed highway engineer of the Clovis District, New Mexico.

Jacobson, Robt. T., has been appointed city engineer, Fargo, N. D.

Jones, D. W., has resigned the position of engineer of the Clovis Highway District, N. M., to accept a position with the Clovis Chamber of Commerce.

Anders, Frank L., recently city engineer, Fargo, N. D., has engaged in consulting practice.

Neslen, C. Clarence, commissioner of water supply and water works, Salt Lake City, Utah, retains the same position in the reorganization of the Board of Commissioners.

Bock, E. A., Mayor of Salt Lake City, Utah, has been made commissioner of Public Safety.

Greene, Herman H., has been made commissioner of Public Affairs and Finance, Salt Lake City, Utah.

Crabbe, A. H., has been made commissioner of Park and Public Property, Salt Lake City, Utah.

Burton, T. T., has been made commissioner of Streets and Public Improvements, Salt Lake City, Utah.

McKay, Capt. W. Johnston, City Manager of Newburg, N. Y., has requested his salary be reduced from $6,000 to $5,000 and the difference distributed among lower paid city officials.

Vars, Alexander W., has resigned as town surveyor of Westfield and has been appointed city engineer of Plainfield, N. J.

Collins, Wesley C., has been appointed surveyor and clerk of the purchasing board of Westfield, N. J. Mr. Collins is a graduate engineer with several years' practical experience on the Central Railroad of New Jersey in sewer construction in Westfield and as principal assistant in the engineering office of A. W. Vars, Plainfield.

Pilcher, Lewis E., has been appointed architect of New York State and the New York State Association of Builders has endorsed the governor's choice.

Davis, E. H., has been appointed chief engineer of the sixth district, Georgia Highway Department.

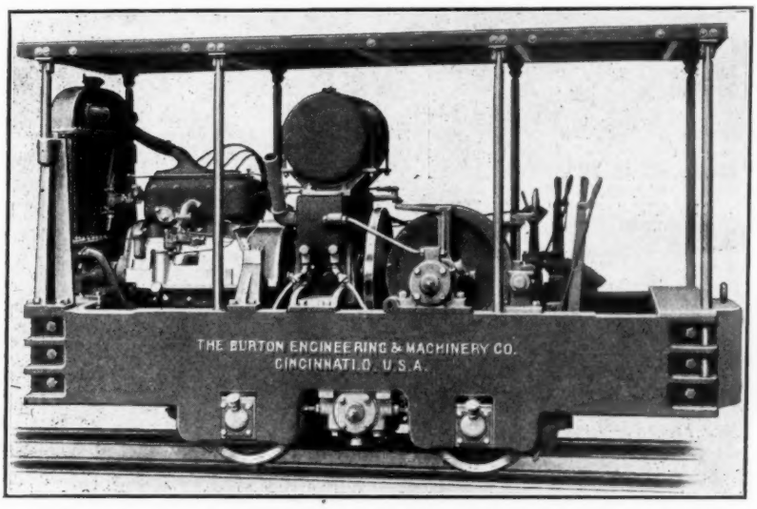
Marble, Arthur I., has resigned as city engineer of Lawrence, Mass.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

Burton Gasoline Locomotive.

This 3½-ton, class D locomotive is 10 feet 5 inches long, 6 feet 5 inches high, has a 39-inch wheel base and weighs 7,000 pounds. It has a draw bar pull of 1,400 pounds at 5 miles per hour and 700 pounds at 10 miles per hour. It can be operated either by gasolene or kerosene, consuming from 5 to 10 gallons per hour, and is designed and constructed with special reference to free access and simplicity of parts.



NARROW GAGE GASOLENE LOCOMOTIVE READY FOR SERVICE.

Among the special features emphasized by the manufacturers are the Herschell-Spillman motor with four 3½-inch cylinders and 5-inch stroke, rated at 25 h. p. for 1,000 r. p. m., and at 41 h. p. for 2,000 r. p. m.; cooling system with a honey comb core construction radiator supported by special spring hangers to protect it from shock and located at the front of the locomotive and provided with a special fan with reversible blades, giving a positive cooling whether the locomotive is running forward or backward; spur friction with heavy bearings; cast iron brake shoes operated by toggle joint mechanism and equalizing on all four wheels, and operation by an easily accessible hand lever. Finest material throughout.

Brockway Motor Trucks.

The new handsomely illustrated catalog of these trucks, which are made in 1½, 2½, 3½ and 5-ton sizes with worm drives, gives photographs of some of their special parts, of different types of body and of large groups of trucks parked ready for shipment for United States cantonments and other destinations.

Special stress is laid on the manufacture of individual parts by the maker with the combination of the best specialties like motors, axles and other highly developed parts that have great recognized merits.

Four-Wheel-Drive Tractors,

The four-wheel-drive tractors manufactured by the Topp-Stewart Co. are rated from 30 to 45 h. p., have a 108-inch wheel base, 11-foot turning radius, speed of 4½, 2½ and 1¾ miles per hour and weigh 7,500 pounds. They are guaranteed to handle four fourteen inch bottom plows and to handle a 10-foot blade road grader under normal conditions.

Special features emphasized by the manufacturers include differential and drive shaft housing, rigid with axles; two or four wheel steer; power applied to rims of four wheels by enclosed alloy steel pinion and cut gears; tubular annealed cast steel axles; roller bearings, and even distribution of weight on all four wheels, giving maximum traction value.

Hydraulic Hoist and Truck Dumper

The Horizontal Hydraulic Hoist Co. has put on the market an improved equipment consisting of horizontal hydraulic hoists and dump bodies for motor trucks. The complete outfit includes a horizontal hydraulic cylinder and pump with connections mounted on a structural steel frame with proper attachments and with a clutch that drives the pump mechanism from the truck propeller shaft, and a truck body having a double acting tail gate, hinged at both top and bottom, and removable side boards equipped with stakes set in pockets.

The horizontal hydraulic hoist is installed entirely below the truck body, thus avoiding any obstruction of loading space on the chassis. The leverage is such as to make the cylinder pressure nearly constant throughout the entire stroke, and the manner of mounting assures the distribution of the hoisting stress for a distance of 5 feet along the truck frame, over the rear springs and axle, so that no concentrated hoisting stress is imposed on the frame. No portion of the hoisting mechanism extends below the truck frames or interferes with brake rods and other truck mechanism. The control is very simple and is governed by setting the lever at raising, holding or lowering positions. The truck body can be raised or tilted or lowered while the pump is in operation, or the pump can be stopped and held in any position that may be desired while raising or lowering.

Willite Pavement

The Willite Road Construction Co. of America has issued a small pamphlet of Armor Plate roads or hard top highways, surfaced with Willite, which in recent years has been laid in several states and in Canada. Willite pavement is a two-course construction made chiefly of local materials and containing from 80 to 85 per cent of aggregate and from ¼ of 1 per cent to ½ of 1 per cent of metallic sulphate for tempering the asphaltic paving cement forming the wearing surface which may be prepared in any paving plant suitable for making asphaltic mixtures, thus eliminating the necessity for special equipment. No binder course is used and a pavement consisting of 3-inch base and 2-inch wearing surface, has a total weight of 500 pounds per sq. yd. of surface in comparison with 632 pounds to 1,245 pounds for various other kinds

of pavements mentioned with total thicknesses of 6 to 13 inches. It is claimed that Willite is cheaper than asphalt block or brick pavements on concrete base; that it will not soften or harden or become brittle; is not slippery; is almost completely waterproof; can be used immediately after laying; and is very durable.

"Western" Concrete Road Plant.

Catalog 45 of the Western Wheeled Scraper Co. is devoted to standard equipment for concrete road construction. It contains illustrations and descriptions of elevated wooden storage bins for aggregate and cement, which are made in sections that can be shipped on flat cars and installed alongside the railroad track, where they are filled by means of a derrick or other elevating devices, and deliver through bottom valves or gates to cars run on an industrial railway track laid on the surface of the ground under the bins.

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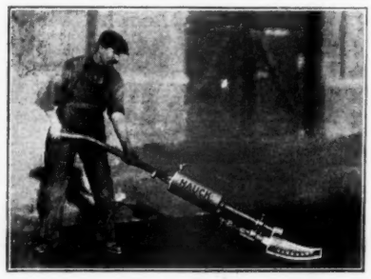
Self-Heating Asphalt Smoother

The Hauck Mfg. Co. has just placed on the market a new type, self heating asphalt smoothing iron that, it is claimed, reduces the cost of smoothing by 80 per cent. It is a self-contained tool, not much more bulky than the ordinary furnace heated smoother, and has a weight of 60 pounds, ample for pressure requirements. It is very compact, has the kerosene oil burning device protected by a shield, not shown in the engraving, and can be operated by a single man who



OIL BURNING SELF HEATING SMOOTHER.

controls the flame by a regulator just forward of the main handle.

The handle carries a 1½-gallon tank equipped with hand pump, filler plug, gage and kerosene burner with an oil needle valve and strainer. It can be operated by any laborer, thus saving the time of two men, and need not be removed from the surface of the asphalt until the smoothing of the entire area is completed. Its use eliminates the disagreeable wood fire wagon and the transportation of the iron from it to the pavement and it saves from 60 to 75 per cent in the cost of fuel.

INDUSTRIAL NEWS

Permanent Construction Machinery Fair.

An innovation in the sale and demonstration of engineering construction plants and equipment that should be of considerable value and importance both to manufacturers dealers and consumers, has been inaugurated at Center and Walker streets, New York City, by the recent opening, by the Allied Machinery Company of America, of a permanent fair for the exhibition of standard machines.

Such items as locomotives, steam engines, motors, trench excavators, road rollers, shovels, hoisting engines, electrical and gasolene equipment and even hand tools, are displayed on one floor, while on the next floor there are located the business offices of the fifteen dealers already represented in this association. The exhibition is intended to promote both foreign and domestic sales, and is supplemented by provisions for demonstration of the actual operation of the plants by experts, who are not only able to explain their mechanical action and construction, but are also qualified to anaylze the construction problems of visitors and to suggest to them desirable plans for the selection and arrangements of plants and for a proper co-ordination in construction, maintenance and operation. This should enable purchasers not only to secure the most durable and efficient machinery, but to exercise intelligent discrimination in purchasing that which is most likely to be suitable for future needs and to be adaptable for modified service. This feature will be a rational development of the practice, already inaugurated by some leading manufacturers, of designing the installation and auxiliaries for customers who purchase quantities of their plant for important service. At a formal luncheon given at the opening of the exhibit on January 27, addresses were made by J. W. Alexander, secretary of commerce; G. C. Redfield, former secretary of commerce; Senator Edge, W. L. Saunders and G. E. Smith.

The following firms are already participating in this exhibit: Austin Manufacturing Co., Austin Western Road Machinery Co., Barber Greene Co., Carbic Manufacturing Co., C. H. and E. Manufacturing Co., Inc., Clyde Iron Works, Cook Motor Co., A. B. Farquhar Co., Ltd., Hydraulic Pressed Steel Co., Lakewood Engineering Co., Parsons Co., Sterling Wheelbarrow Co., Thew Automatic Shovel Co. , Western Wheeled Scraper Co., Wyoming Shovel Works.

A Durable Smith Mixer.

James Horrabin & Company, Des Moines, have recently purchased from the Pierson Construction Company a Smith Power Concrete Mixing machine, which has been in constant operation for about 18 years. This machine is one of the first ever built by T. L. Smith, founder of the manufacturing compay, and that it should still be not only usable, but salable is a sufficient comment on its quality.

The American-La France Fire Engine Company, Inc., sold during the month of January thirty-nine engines, water towers, service truck, combinations and triple combinations and Brockway cars to thirty-nine cities in eighteen states.

The Bureau of Highways, Philadelphia, contemplates the establishment of a $150,000 asphalt plant for street repair work.